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ABSTRACT

A study was conducted to examine the associations among the processes, skills, and content of the writing of children aged 9 through 14 years. A further objective was to explore the impact of developmetal changes by comparing the performance of children at the 9-10, 11-12, and 13-14 year age-levels. Subjects were 340 average students and 268 students with learning difficulties. Three writing tasks were designed to evaluate written output under increasingly demanding requirements for processing, memory, and organization: timed alphabet production, timed sentence memory items, and timed paragraph writing task. Each child's performance was rated for speed, motor fluency, quality of symbol production, and spatial organization. The results revealed significant differences between normal achievers and the learning difficulty group on virtually all writing measures. In particular, the children with learning difficulties showed significantly more problems on each of the nine processing measures of writing efficiency, including motor fluency, symbol production, and spatial orientation. They also wrote shorter paragraphs, used grammatically simpler sentences, and displayed a higher prevalence of semantic and syntactic confusions. The results suggest that children with learning difficulties struggle not only with the complex language and cognitive components of written output, but also with the basic prerequisites for writing efficiency that have already been acquired by their peer group. (HTH)

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A DEVELOPMENTAL STUDY OF THE COMPONENTS OF WRITTEN LANGUAGE IN CHILDREN WITH AND WITHOUT LEARNING DIFFICULTIES

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A Developmental Study of the Components of Written Language in Children With and Without Learning Difficulties

From fourth grade onwards, there is increasing emphasis on the active organization and integration of information necessary for efficient production of larger volumes of written output. Multi-step projects and independent reports require the automatic mobilization of motor fluency, perceptual-motor skills, memory, language, cognition, and planning. Although recent evidence suggests that deficits in written language are the predominant symptom of learning disabilities among 9-14 year olds (Moran, 1981; Moran & Crump, 1982; review by Poplin, 1983), most investigations have focused on reading deficiencies in this population (Benton & Pearl, 1978; Doehring, Backman, & Waters, 1983). In particular, there have been very few studies of the structural relationships among the various components of written expression, namely, mechanics, language, content, and motor fluency. The present investigation was designed to examine the associations among the processes, skills and content of writing in children with and without learning problems in the hope of improving our diagnostic and treatment techniques. A further objective was to explore the impact of developmental changes on written language by comparing the performance of children at the 9-10, 11-12, and 13-14 year age-levels.

The accurate measurement of written language development has been influenced by the complexity and multiplicity of the various components of writing. Research has proceeded in a number of directions. The majority of studies of written language have examined syntax and vocabulary usage, primarily because these factors have emerged as critical features of oral language (Blair & Crump, 1984; Simms & Crump, 1983; Semel & Wiig, 1975; Vogel, 1974). However, recent findings have indicated that oral and written language differ along numerous dimensions and that discrete investigations of written expression are needed. Syntactic development has been evaluated on the basis of number of words produced, T-units and Syntactic Density Scores (SDS) (Morris & Crump, 1982). Similarly, vocabulary complexity has been determined using various vocabulary indices (Morris & Crump, 1982). Both these methods are complex and can only be analyzed with computer programs designed to read spontaneous writing samples. Consequently, these techniques have had limited application to diagnostic and teaching situations. As a result, the measurement of written language at the research and applied levels has been problematic and most tests have either used a holistic rating or have combined skills into a single score. As is pointed out by Morris & Crump (1982), these approaches do not take account of the interactive nature of the multiple components of written language. The focus of the present study, therefore, was to investigate the complex relationships among the motor, mechanical and linguistic features of written language. Specifically, we examined the associations among language usage, motor fluency, symbol formation, and spatial organization in the hope of constructing a more accurate diagnostic procedure.

Identification of the locus of a writing difficulty is particularly important in children with subtle learning difficulties who are characterized by significant deficits in this achievement area (Morris & Crump, 1982; Poplin, Gray, Larsen, Banikowski, & Mehring, 1980; Prent, 1980; Wiig, and Semel, 1976). Prent (1980) found that writing deficits were the principal characteristic of secondary-level learning disabled students. Similarly, Deno, Masten & Mirlin (1982) identified a three year delay in the written language of children with learning difficulties. Despite the prevalence of these deficits, few existing diagnostic instruments can be used for the differential diagnosis of writing deficits and the development of an appropriate teaching plan. Furthermore, these tests (eg. the Test of Written Language, Hammill & Larsen, 1983; & the Myklebust Picture Story Language Test, Myklebust, 1964) are generally time-consuming and complex to score and interpret. The purpose of this study was to evaluate the efficacy of a diagnostic writing inventory designed to satisfy three major criteria: brevity of administration, simplicity of items and production of process-oriented diagnostic information.

In summary, we proposed to construct a more precise model of written language by integrating and synthesizing three different research and clinical perspectives: developmental psychology, learning disabilities and educational psychology. It was hoped to contribute to the improvement of techniques for identifying and teaching children with specific learning difficulties.

The specific objectives of the study are detailed below:

1. To design a set of simple tasks for the assessment of written expression which measure performance in relation to increasingly complex processing requirments. To determine how these tasks differentiate children with and without learning difficulties.

2. To evaluate the relationships among the various components of writing in children with and without learning difficulties. These components include: motor fluency, symbol production, spatial organization, speed, volume, spelling and quality of language usage.

3. To determine the developmental changes which characterize the structural relationships among these components of writing by comparing children in three age-groups: 9-10 years, 11-12 years, 13-14 years.

Subjects

The sample consisted of 340 9-14 year olds selected randomly from Grades 4-9 in various Massachusetts and New Hampshire schools. In addition, 268 students with learning difficulties were selected only if they were receiving special education services outside the regular classroom or satisfied more than two of the following criteria:

(a) Failing in two or more academic subjects.

(b) Achievement test scores lower than 25% in reading or in arithmetic plus one other area.

(c) Grade retention over the last two years.

(d) Persistent, chronic failure to submit homework.

(e) Chronic social and behavioral problems.

(f) Excessive absenteeism (>25 days) over the year.

All students were from middle-class communities and there was an attempt to maintain an even distribution of males and females.

Materials

(1) Three writing tasks were designed to evaluate written output under increasingly demanding requirements for processing, memory, and organization. These tasks were selected from the Survey of Educational Skills (SEDS), a process measure developed at the Children's Hospital, Boston. This inventory evaluates reading, learning style and characteristic error patterns on various tasks of written language, spelling, and mathematics (Meltzer & Zadig, 1983; Meltzer, Levine et al, 1984; Meltzer, Fenton & Solomon, 1984). These measures compared each child's performance across a number of simple writing tasks which incorporated different levels of input and output, which relied on memory to varying degrees and emphasized planning in multiple ways.

Insert Table 1 about here

Tasks included:

(a) Timed alphabet production which assessed automatization, revisualization and sequential memory. This was considered a Level 1 task with respect to writing complexity.

(b) Timed sentence memory items which involved reading, remembering and writing a grade-appropriate sentence and listening to and reproducing a similar sentence. These compared integration and motor output when visual and auditory sequential memory were involved. These were considered Level 2 writing tasks as they emphasized basic skill acquisition in relation to a slightly greater memory load.

(c) A timed paragraph writing task (expository writing) which evaluated organization and integration of all previously measured processes. In addition, this task measured language facility, ideational fluency, abstract thinking and planning. Three key words were presented and students generated a sentence using one of these words. Thereafter, they were required to write a paragraph with the sentence providing a structured reference point. Paragraph writing was considered a Level 3 writing task because of the complex cognitive, language and memory processes involved.

Each child's performance was rated along four major dimensions of writing efficiency: speed, motor fluency, quality of symbol production and spatial organization (see Table 1). Specific process ratings were developed and interrater reliability amongst four different raters revealed 79% agreement.

Language usage, the first outcome measure, was derived from process ratings of thematic continuity, grammatical complexity, fluency of ideas, and use of abstract ideas. Writing productivity, the second outcome measure, was determined on the basis of the total number of words produced by the child in three-minutes.

(2) Spelling accuracy was assessed using a dictated word list from the Survey of Educational Skills (SEDS). A grade-equivalent

score was derived for each child. In addition, a detailed processing efficiency scale was used to compare spelling errors across the single dictated words and the expository writing task.

Procedure

Each student was tested on a one-to-one basis in the school setting. The study occurred over a two-year time-period. Tasks were presented in the same order for each child.

Results

(a) Prevalence of writing problems in children with and without learning difficulties.

Preliminary analyses compared the relative performance of the normal achievers and the learning difficulty group on the multiple dimensions of the writing inventory. Results revealed significant differences on virtually all the writing measures (see Tables 2,3) with normal achievers showing superior performance. In the learning difficulty group, writing speed was significantly slower across all tasks and all age-groups (see Table 2). Even when the task

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Insert Table 2 about here

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was fairly simple and automatic, as in timed alphabet production, children with learning difficulties displayed an extremely slow and painstaking writing style. A similar trend was evident when efficiency of written output was evaluated using process ratings across three dimensions: motor fluency, spatial organization and symbol production. On most components, the prevalence of deficits was often four or five times higher in the learning difficulty group. Further, the percentage of deficits increased across tasks so that more problems were evident on the level 3 expository writing task than on the level 1 automatized alphabet production task. For instance, 12% of the learning difficulty group displayed problems with letter spacing on the timed alphabet production task (level 1). In comparison, 22% struggled with word and letter spacing on the sentence memory tasks (level 2) and 26% experienced difficulty on the expository writing task (level 3). A similar trend characterized all nine components of the processing efficiency ratings.

Similar findings occurred for quality of language usage and writing productivity (see Table 3).

Insert Table 3 about here

Table 3 indicates that in all three age-groups, a very large proportion of children with learning difficulties evidenced problems with grammatical usage and idea density on the paragraph writing task. A large percentage of normal achievers also struggled with these components of written language; however, in all cases, the number of problems in this

group was still half that of the learning difficulty group. When volume of writing was compared across the two groups and the three age-levels, similar findings occurred. The learning difficulty group was less productive and wrote fewer words in a paragraph than did the normal achievers.

To characterize writing efficiency in the two groups more specifically, the learning difficulty group and the normal achievers were compared using a profile procedure (see Figure 1). Figure 1 provides an example of the application of a profile approach to efficiency in expository writing.

Insert Figure 1 about here

Figure 1 indicates that the prevalence of difficulties in writing efficiency in the normal achievers, ranged from 0%-15% in the 9-10 and 11-12 year olds and was as low as 0-5% in the 13-14 year age group. These low prevalence rates were characteristic of all three writing components: fluency, spatial organization and symbol production. In contrast, the learning difficulty group evidenced a much higher proportion of deficits in writing efficiency. In fact, 40-45% of the children in the three age-groups experienced significant difficulties on a number of critical dimensions of motor output and symbol production. For instance, writing fluency and quality of motor output were areas of particular weakness, as were frequency of letter retracings and quality of symbol production.

Figure 1 indicates that the normal achievers displayed relatively flat performance profiles, in contrast with the learning difficulty group which evidenced significant scatter with frequent peaks and valleys. It was interesting to note that the variability which did occur in the normal achievers resulted from difficulty on the same items as the learning difficulty group. In both groups and at all age-levels, the highest percentage of weaknesses occurred for fluency and quality of motor output, quality of symbol production and letter retracings. Errors that occurred least included letter reversals and use of mixed cases.

Specific rating dimensions were applied to all the writing tasks to evaluate characteristic error patterns and learning style. Table 4 presents an example of the application of these rating dimensions to spelling. The percentage of spelling errors during paragraph writing is summarized for the two groups and the three age-levels.

Insert Table 4 about here

Inspection of Table 4 indicates that the learning difficulty group and the normal achievers differed significantly with respect to the prevalence of errors on all dimensions. In particular, nearly one third of the learning difficulty group displayed problems with the accurate spelling of multi-syllabic words, vowel digraphs, and words which incorporated invariant spelling. It is noteworthy that the prevalence of types of spelling errors was similar across the three age-groups. For instance, in the learning difficulty group, the percentage of errors

using consonant blends was 17%, 18% and 20% in the 9-10, 11-12, and 13-14 year olds respectively. In the normal achievers the percentage of these errors was 3%, 2% and 2% across the three age levels.

(b) Factor Analysis:

Factor analysis procedures were applied to the group of 588 children (collapsed across age-groups and achievement levels), in order to determine the underlying structural components. Twenty students were eliminated from the analysis because of missing data. Results are summarized in Table 5.

Insert Table 5 about here

The varimax rotated factor matrix yielded five major factors which measured discrete processes. The first factor was labelled "motor fluency" as this incorporated measures of fluency, symbol production and pencil grasp for tasks ranging from simple automatized writing to the complex demands of expository writing. The second factor was identified as "spatial organization" since the highest loadings were derived from the process ratings of spatial organization. The third major factor, the "Productivity Index" (P), incorporated spelling accuracy, volume of written work, and language usage. The fourth factor, "writing memory", was associated with accuracy of sequential memory when visual and auditory sequences were presented. The fifth and final factor assessed writing speed or "rate of output" across the three increasingly complex writing tasks.

(c) Regression Analyses

Table 6 presents the results of stepwise regression analyses in which the volume of output and quality of language usage served as dependent variables while the writing subskills served as predictors. Separate regression analyses were obtained for the normal achievers and the learning difficulty group.

Insert Table 6 about here

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(1) Volume of written output (number of words in the paragraph)

Inspection of Table 6 indicates that the first four variables entered into the regression equations resulted in a multiple R of .50 for the normal achievers and .60 for the learning difficulty group. Spelling accuracy accounted for the largest proportion of variance in both groups and was entered into the equation on the first step. Further comparison of findings indicates that added variance was explained on the basis of a combination of different variables for the two groups. In the group of normal achievers, two of the three critical predictors (writing speed, spatial organization) were associated with sentence memory, a second -level writing task. In contrast, in the learning difficulty group, two of the three critical predictors of writing volume (speed, spatial organization) were associated with an automatized writing task, alphabet production.

(2) Quality of language usage

Further inspection of Table 6 indicates a similar trend for the second outcome measure, quality of language usage. The multiple

correlation was again somewhat higher for the learning difficulty group (R=.55) than for the normal achievers (R=.49). Accuracy of memory for spelling of dictated words and for sentence memory were important predictors of language usage in writing for both the normal achievers and the learning difficulty group. For normal achievers, two critical predictors were associated with quality of symbol production. This represents a second-level cognitive process, as symbol production is a function of accurate visual memory. In contrast, in the learning difficulty group, lower-level processes were critical predictors, as represented by speed of alphabet production.

Discriminant Analysis

Discriminant function analysis was applied to determine whether performance on the writing inventory accurately predicted a child's membership in the learning difficulty or the normal group (see Table 7).

Insert Table 7 about there

Results indicated that 77% of the children were correctly classified on the basis of their writing performance. Specifically, 69% of the children with learning difficulties were categorized correctly and 83% of the normal achievers were appropriately grouped. Further inspection of Table 7 indicates that only 17% of the normal achievers displayed writing profiles which were similar to the learning difficulty group. A higher prevalence of children with learning difficulties (31%)

evidenced normal written expression. The combination of writing subskills which was most predictive of group membership was: spelling accuracy, error patterns noted on the dictated sentence, quality of symbol formation during the paragraph writing task, and spatial organization on alphabet production.

Discussion and Conclusions

The findings of this study reveal a number of major themes. First, significant differences characterized children with and without learning difficulties on all the writing dimensions. In particular, the children with learning difficulties evidenced significantly more problems on each of the nine processing measures of writing efficiency, namely, motor fluency, adequate symbol production and appropriate spatial orientation of letters and words. They also wrote shorter paragraphs, used grammatically simpler sentences and displayed a higher prevalence of semantic and syntactic confusions.

These results are consistent with previous studies (Myklebust, 1973; Poteet, 1979; Weiner, 1980) which indicate that children with learning difficulties perform below their peers in total productivity and syntactic skill. Our findings go beyond these studies as they suggest that these children struggle not only with the complex language and cognitive components of written output, but also with the basic prerequisites for writing efficiency which have already been automatized by their peer group.

The second major theme relates to the impact of developmental changes on the efficiency, volume, and quality of written output. Our findings suggest that the multiplicity of problems with motor fluency,

spatial organization and symbol production decreased with age in normal achievers. In fact, 13-14 year olds exhibited appropriate performance in all these areas and weaknesses are virtually non-existent. In contrast, a large proportion of children with learning difficulties continued to struggle with motor output, spatial alignment and quality of symbol production even at 13-14 years. This suggests that the specificity of diagnosis could be improved by emphasizing a more refined assessment which can begin to identify the locus of each child's writing problems. A diagnostic writing inventory which incorporates measures of motor fluency, spatial organization and symbol production would be important additions to the currently more popular measures of vocabulary and the T-unit index of syntactic maturity (review by Moran, 1981). This would facilitate a more global assessment procedure which accounts for the interactions among all the dimensions of writing and also for the impact of developmental changes.

The third set of findings relates to the role of spelling accuracy in expository writing. Spelling skill was a critical predictor of language usage and volume of written output in both groups. This is consistent with previous studies which have reported significant spelling deficits in learning disabled children (Baker, 1971; Poplin, Gray, Larsen, Banikowski, and Mehring, 1980). Our study goes further than the majority of previous investigations which have measured dictated spelling in isolation rather than the association between this skill and expository writing.

The most critical implication of the study relates to the results of discriminant analysis. Findings reveal that a brief diagnostic

writing inventory which requires less than 20 minutes administration time, could be used successfully to differentiate children with and without learning problems. This inventory could incorporate a measure of spelling accuracy, a sentence memory task, process ratings of writing efficiency, and an automatized writing task such as timed alphabet production. In the diagnostic setting, data from such a process-oriented inventory could provide invaluable descriptive information as part of the differential diagnosis of a learning difficulty. Further, the profile which is developed after application of such a multi-dimensional writing inventory could yield the basis for the design and implementation of specific treatment programs. This would help to overcome the current paucity of specific techniques available for the diagnosis and treatment of writing problems.

It is important to keep in mind that the writing tasks used in this study do not constitute a complete diagnostic inventory to be applied in isolation. These are generally utilized in conjunction with measures of receptive and expressive language, memory, visual-motor coordination, abstract reasoning and other educational skills such as reading and mathematics. The present study is the first in a series of reports concerning the developmental and educational profiles which result from the application of these tasks. Current analyses are focused on determining the relationships among performance on these writing tasks, on measures of cognition and language, and on teacher questionnaires.

Finally, these results suggest that a process-oriented writing inventory such as this might provide a useful approach for classroom teachers who could develop individualized teaching programs for normal achievers. As children show progress on specific writing dimensions

(eg word alignment, frequency of letter retracings), they could be introduced to the next most complex writing dimension. This would provide a more structured approach to the teaching of writing and would hopefully reduce the prevalence of writing deficiencies at later grade-levels.

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Table 1

WRITING INVENTORY: RATING DIMENSIONS FOR DETERMINING CONCERNS

SUBSKILL	RATING DIMENSIONS	EXAMPLES
1. Pencil grasp	Grasp; pressure; handedness	
2. Timed alphabet production (Automatized writing)	Speed; motor fluency; spatial organization; quality of symbol production	Number of letters incorrect, omitted, and reversed
3. Read-write from memory Listen-write from memory (Basic skill acquisition)	Motor fluency; spatial organization; quality of symbol production; speed; accuracy of recall	Difficulty with semantics & syntax; word omissions or substitutions; spelling errors
4 Paragraph writing (Expository writing)	Writing productivity/volume; accuracy of spelling and puntuation; language usage; grammatical complexity; thematic continuity; idea density; motor fluency; spatial organization; quality of symbol production	Number of words; number of verbs; writing fluency; letter & word alignment; re-tracings

Note: Levels of writing complexity

Alphabet production = a level 1 writing task
Sentences from memory = a level 2 writing task
Expository writing (paragraph) = a level 3 writing task

TABLE 2

PREVALENCE OF DEFICITS IN WRITING EFFICIENCY IN 9-14 YEAR OLDS:
COMPARISON OF THE LEARNING DIFFICULTY GROUP AND THE NORMAL ACHIEVERS

	AUTOMATIZED WRITING (LEVEL 1)		BASIC SKILL ACQUISITION (LEVEL 2)		EXPOSITORY WRITING (LEVEL 3)	
	LEARNING DIFFICULTY	NORMAL	LEARNING DIFFICULTY	NORMAL	LEARNING DIFFICULTY	NORMAL
Speed						
Mean number of seconds	71	48	41	34	—	—
Motor Output						
Writing fluency	33	7	35	7	37	10
Pencil pressure	23	9	25	8	27	4
Overall motor output	21	4	35	7	37	9
Spatial Organization						
Word alignment	--	--	25	7	29	7
Letter/word spacing	12	2	22	7	26	8
Reversals	4	0	3	0	4	0
Symbol Production						
Retracings	27	8	26	6	40	10
Upper/lower	15	4	13	3	7	1
Overall symbol quality	19	2	28	5	35	4

1. Assessed using timed alphabet production
2. Assessed using a timed sentence memory task
3. Creative paragraph production in response to specific key words

Table 3

PREVALENCE OF WEAKNESSES IN WRITING PRODUCTIVITY & LANGUAGE USAGE IN CHILDREN WITH AND WITHOUT LEARNING DIFFICULTIES (AGES 9-14)

	AGE GROUP					
	9-10 yrs (n=126)		11-12 yrs (n=100)		13-14 yrs (n=114)	
	LD	NORMAL	LD	NORMAL	LD	NORMAL
	%	%	%	%	%	%
Difficulty w/ grammatical complexity	75	28	71	31	78	27
Difficulty w/ thematic continuity	44	12	45	15	46	7
Difficulty w/ idea density	65	31	72	33	73	27
Mean number of words	22	31	26	35	28	43

Note: Process ratings were obtained on the paragraph writing task

Figure 1.

PREVALENCE OF DIFFICULTIES IN WRITING EFFICIENCY ON AN EXPOSITORY WRITING TASK: COMPARISON OF CHILDREN WITH & WITHOUT LEARNING DIFFICULTIES ACROSS THREE AGE GROUPS

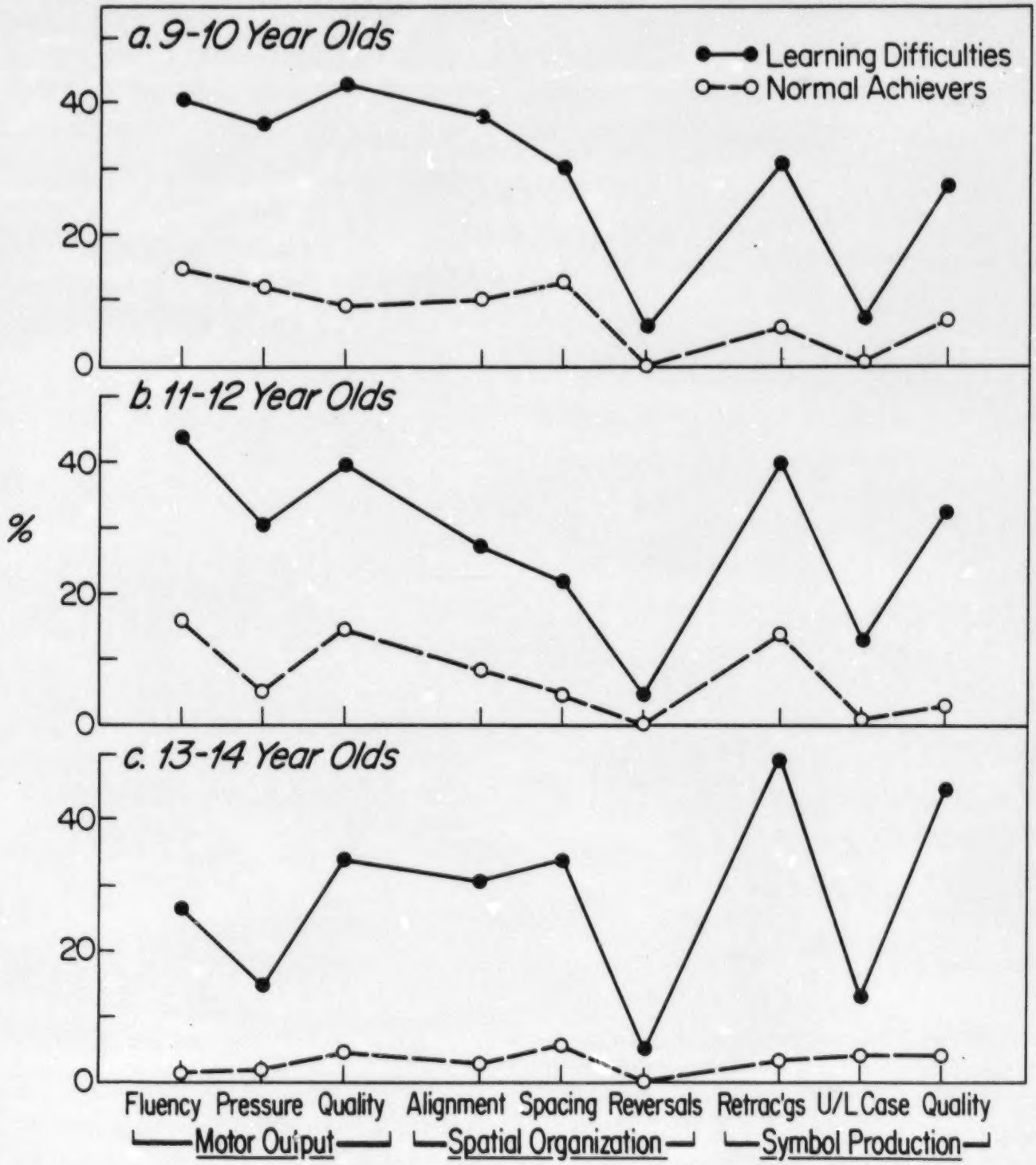

Table 4

PREVALENCE OF SPELLING DIFFICULTIES IN THE CONTEXT OF A PARAGRAPH WRITING IN CHILDREN WITH AND WITHOUT LEARNING DIFFICULTIES

ERROR ANALYSIS	9-10 (N=126)		11-12 (N=158)		13-14 (N=110)	
	LD %	N %	LD %	N %	LD %	N %
C-V-C WORDS	6	0	3	0	5	0
RULE OF SILENT "e"	11	3	11	0	9	0
MULTISYLLABIC WORDS	30	10	31	6	42	7
VOWEL DIGRAPHS	21	7	28	0	31	2
CONSONANT BLENDS	17	3	18	2	20	2
CONSONANT DOUBLING	18	7	20	4	20	5
INVARIANT SPELLING	32	16	33	9	38	7

Table 5

VARIMAX ROTATED FACTOR MATRIX FOR THE WRITING INVENTORY
(N=155)

	Motor Fluency	Spatial Organization	Productivity Index (p)	Writing Memory	Writing Speed
Motor fluency-alphabet	.72*	.30	.16	.04	.38
Spatial organization-alphabet	.16	.47*	.10	.08	.26
Symbol production-alphabet	.35*	.44*	.15	.21	.19
Motor fluency-sentence	.80*	.24	.20	.12	.10
Spatial organization-sentence	.15	.73*	.04	.05	.04
Symbol production-sentence	.42*	.42*	.15	.43*	.03
Motor fluency-paragraph	.75*	.28	.28	.15	.03
Spatial organization-praragraph	.20	.70*	.15	.16	.03
Symbol production-paragraph	.39*	.46*	.23	.39*	.22
Pencil grasp	.46*	.10	.08	.04	.19
Speed-alphabet	.28	.17	.38	.10	.57*
Speed-sentence-visual memory	.16	.01	.22	.30	.35*
Speed-sentence-auditory memory	.12	.08	.20	.33	.41*
Accuracy-sentence-visual memory	.01	.07	.06	.69*	.09
Accuracy-sentence-auditory memory	.05	.15	.15	.69*	.13
Spelling accuracy	.22	.16	.63*	.13	.28
Writing-volume	.12	.15	.70*	.09	.22
Writing-language usage	.28	.15	.58*	.28	.04

Table 6

QUALITY AND VOLUME OF WRITING PRODUCTIVITY:
RELATIONSHIP WITH THE WRITING SUBSKILLS
AS DETERMINED BY STEPWISE REGRESSION ANALYSIS

DEPENDENT VARIABLE	STEP	NORMAL ACHIEVERS (N=355) SUBSKILL	r	R	R^2	R^2 change	LEARNING DIFFICULTY (N=253) SUBSKILL	r	R	R^2	R^2 change
PRODUCTIVITY-VOLUME OF OUTPUT	1	SPELLING	.45	.45	.20	.20*	SPELLING	.54	.54	.30	.30*
	2	MOTOR FLUENCY-ALPH	.27	.48	.23	.23*	SPEED-ALPH	.37	.57	.33	.03*
	3	SPEED-SENTENCE MEMORY	.20	.49	.24	.02*	ACCURACY-SENTENCE MEMORY	.59	.35	.35	.02*
	4	SPATIAL-SENTENCE MEMORY	.03	.50	.25	.01*	SPATIAL-ALPH	.30	.60	.36	.02*
LANGUAGE USAGE	1	SYMBOL PRODUCTION-PARAGRAPH	.39	.39	.16	.16*	SPELLING	.41	.41	.17	.17*
	2	SPELLING	.29	.45	.20	.04*	MOTOR FLUENCY-PAR	.40	.51	.26	.09*
	3	SYMBOL PRODUCTION ALPHABET	.30	.47	.22	.03*	ACCURACY SENTENCE MEM	.29	.54	.29	.03*
	4	ACCURACY SENTENCE MEMORY	.10	.49	.24	.02*	SPEED-ALPHABET	.33	.55	.30	.01*

Note: ALPH= Alphabet
Sentence MEM=Production from memory of a grade level sentence
Par = Paragraph

Table 7

UTILITY OF THE WRITING INVENTORY FOR PREDICTING THE LEARNING DIFFICULTIES OF 9-14 YEAR OLDS: DISCRIMINANT ANALYSIS FINDINGS

ACTUAL GROUP MEMBERSHIP	PREDICTED GROUP MEMBERSHIP		
	N	LEARNING DIFFICULTY N %	NORMAL N %
LEARNING DIFFICULTY	268	185* 69%*	83 31%
NORMAL	340	59 17%	281* 83%*

Note: (1) *Correct prediction of group membership on the basis of discriminant function analysis.

(2) Writing measures which were most predictive of group membership were:
- (a) Spelling accuracy
- (b) Error patterns noted on the dictated sentence.
- (c) Symbol formation during paragraph writing
- (d) Spatial organization during alphabet production.